551.506 (73)

DETAILS OF THE WEATHER IN THE UNITED STATES

GENERAL CONDITIONS

Mostly a warm and dry month; cool in southern Rocky Mountain region, along the Gulf and Atlantic coasts, in New England and the eastern part of the lake region. Monthly extremes of temperature were exceptional; in some localities the highest temperature of record for the month occurred; in still others the minimum for the month was as low as previously recorded and in a few cases 1 or 2 degrees lower.

More than the normal rain fell in the southern Rocky Mountain region, in Washington, Texas, and at isolated places elsewhere.

CYCLONES AND ANTICYCLONES

By W. P. DAY

The month was typical with respect to the general character of the HIGHS and LOWS, which began to resemble the less active summer types. The relatively large number of LOWS plotted, 17, was due in part to the development of small barometric disturbances in the troughs of low pressure, which carried on for a few observations and then dissipated, followed by new developments as the trough moved slowly eastward.

The HIGHS were generally weak and few in number, there being only about half the number noted in February and March of this year. The minimum number for any month usually occurs in June in the United States, corresponding to the summer solstice with its lessened polar-equatorial temperature gradient.

FREE-AIR SUMMARY

By V. E. JAKL

Free-air temperature departures from the normal on the whole followed those at the surface, and consequently were practically the same as those shown on Chart III, this REVIEW. Free-air relative humidities were about normal.

Resultant winds showed no important departures from the normal. (See Table 2.) Directions were generally southwesterly near the surface, changing gradually to about west-northwest at altitudes of 4,000 meters and above. The best example of east component winds extending to high altitudes was observed on the 11th and 12th at Lansing, Ellendale, Madison, and Royal Center, in connection with an extensive HIGH covering northern and western sections, with a LOW over the southeastern States. The highest velocity was 46 m. p. s. from the north-northwest at 2,750 meters, recorded at Burlington on the 12th, in the rear of a LOW over Newfoundland.

A number of interesting examples of vertical convectional currents due principally to insolation are shown by two-theodolite pilot-balloon observations at Ellendale. The effect of a rapid rise in surface temperature on the 4th was shown by an ascending current in the afternoon which extended without interruption and at an almost uniform rate of about 4 m. p. s. up to 4,200 meters. The kite flight on this date, reaching 3,500 meters, showed a dry adiabatic lapse rate throughout the extent of the observation. On the 14th an observation at 1 p. m. showed an ascending current of about 1.5 m. p. s., extending to 2,000 meters, while at 4 p. m. a descending current of about 0.8 m. p. s. extended from 900 meters to 1,700 meters. The kite flight showed a dry adiabatic rate to 2,100 meters, above which was an inversion. On the 17th the balloon encountered a descending current of about 2 m. p. s. from 900 meters to 1,300 meters and an ascending current of about 1.7 m. p. s. from 2,000 meters to 3,400 meters. This observation was also made under conditions of high lapse rate. Incidentally in all these three cases, relative humidities as far aloft as observed were rather low.

Another instance of ascending current under quite different circumstances, viz, in a thunderstorm, is shown by a kite flight at Royal Center on the 17th. An extract from the report of the station, also the record of this flight, follows:

> The week was generally showery with thunderstorms, which made kite flying rather dangerous. On the 17th the kites were struck by lightning when they were caught in a quickly developing thunderstorm that was attended by rain and hail. The record shows a very rapid ascent of the kites beginning at 2:35 p. m. and continuing until the wire was destroyed by lightning at 2:54 p. m. This rapid rise was due to the strong ascending current under the storm cloud. The headkite continued to rise for a minute after the wire was burned and then fell abruptly, its fall being due either to having become heavy with moisture or having fallen out of the ascending current.

Altitude m. s. l.	Temperature	$\frac{\Delta t}{100\ m}$	Relative humidity	Wind	
				Direction	Velocity
Meters	° *C.*		%		*M. p. s.*
225 (surface)	25.9		44	W.	5
574	21.7	1.20	44	W.	7
1406	11.8	1.19	69	W.	12
2163	5.2	.87	94	W.	8
2605	3.2	.45	95	W.	8

Peculiarly, the lapse rate in this record diminishes with altitude, while the humidity increases to practically the saturation point at the top. It is therefore to be inferred that the thunderstorm was not a purely local one and that the strong ascending current was due to causes other than simple thermal convection.

The occasionally observed instances of a reversal of the normal increase of wind velocity with altitude are well illustrated in a number of afternoon observations. Morning observations under these conditions show a rapid increase in velocity for the first few hundred meters, followed by a steady decrease to some fairly high altitude. The convection that later arises following the disappearance of the nocturnal temperature inversion causes an increase in surface velocity, and therefore a more or less regular fall in velocity from the ground upward results. A well-defined example was recorded at Ellendale on the 1st, when a north wind diminished gradually from a surface velocity of 13 m. p. s. to 1 m. p. s. at 3,200 meters, above which it changed abruptly with increasing velocity to south-southwest. Ordinarily, however, under these conditions, some increase in velocity with altitude is still evident in the first few hundred meters, even in mid-afternoon, as at Broken Arrow on the 27th, where a south-southeast wind increased from 10 m. p. s. to 18 m. p. s. in the first 400 meters, but thence diminished steadily to 1 m. p. s. at 2,600 meters.

An airplane observation at the Naval Air Station at Washington on the 27th shows the possibilities of obtaining free-air records to great altitudes by this method. The flight extended to 6,165 meters altitude, in a wind ranging from light northeast on the ground to strong northwest in the upper few thousand meters. The lapse rate averaged 0.42, with small inversions at 1,300 meters and 2,400 meters.

TABLE 2.—*Free-air resultant winds (m. p. s.) during May, 1926*

Altitude, m. s. l.	Broken Arrow, Okla. (233 meters)				Due West, S. C. (217 meters)				Ellendale, N. Dak. (444 meters)				Groesbeck, Tex. (141 meters)				Royal Center, Ind. (225 meters)				Washington, D. C. (34 meters)	
	Mean		8-year mean		Mean		6-year mean		Mean		9-year mean		Mean		8-year mean		Mean		8-year mean		Mean	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Meters																						
Surface	S. 13°W.	3.1	S. 13°E.	1.7	S. 79°W.	1.6	W.	0.5	N. 5°W.	0.5	N. 14°E.	0.4	S. 18°W.	3.6	S. 11°E.	2.0	S. 61°W.	1.7	N. 82°W.	0.2	N. 26°W.	0.7
250	S. 10°W.	3.4	S. 12°E.	1.8	S. 75°W.	2.1	S. 80°W.	0.6	------	------	------	------	S. 15°W.	3.8	S. 7°E.	2.6	S. 66°W.	1.9	S. 76°W.	0.3	------	------
500	S. 24°W.	4.5	S. 2°E.	2.5	S. 82°W.	3.9	S. 85°W.	1.3	N. 9°W.	0.5	N. 26°E.	0.2	S. 14°W.	5.0	S.	3.8	S. 67°W.	3.3	S. 65°W.	1.2	N. 40°W.	2.3
750	S. 23°W.	4.4	S. 6°W.	2.9	S. 85°W.	4.8	S. 84°W.	1.9	N. 8°W.	0.2	S. 14°E.	0.4	S. 15°W.	5.4	S. 8°W.	4.3	S. 84°W.	3.9	S. 74°W.	1.8	N. 50°W.	3.6
1,000	S. 33°W.	4.6	S. 21°W.	3.0	S. 85°W.	5.6	S. 88°W.	2.4	N. 11°W.	0.1	S. 8°W.	0.7	S. 24°W.	5.5	S. 20°W.	4.7	N. 85°W.	4.6	S. 85°W.	2.4	N. 42°W.	4.7
1,250	S. 38°W.	4.4	S. 36°W.	3.2	S. 84°W.	6.5	S. 80°W.	3.5	S. 26°W.	0.7	S. 24°W.	1.0	S. 29°W.	5.3	S. 27°W.	4.9	N. 77°W.	5.1	N. 84°W.	2.9	N. 39°W.	6.0
1,500	S. 45°W.	4.4	S. 47°W.	3.6	S. 79°W.	7.0	S. 78°W.	4.6	S. 31°W.	1.0	S. 36°W.	1.4	S. 35°W.	4.5	S. 36°W.	4.6	N. 82°W.	5.7	N. 86°W.	3.2	N. 42°W.	7.9
2,000	S. 54°W.	4.8	S. 64°W.	4.1	S. 78°W.	8.7	S. 80°W.	6.0	S. 69°W.	3.0	S. 58°W.	2.5	S. 56°W.	4.0	S. 49°W.	4.6	N. 80°W.	6.1	N. 89°W.	5.6	N. 50°W.	8.7
2,500	S. 66°W.	4.4	S. 82°W.	5.0	S. 76°W.	12.4	S. 82°W.	8.0	S. 75°W.	4.4	S. 64°W.	3.9	S. 59°W.	5.0	S. 63°W.	5.0	N. 80°W.	6.5	N. 84°W.	5.3	N. 57°W.	9.5
3,000	S. 68°W.	4.9	N. 87°W.	5.7	S. 77°W.	14.1	S. 80°W.	8.1	S. 70°W.	5.8	S. 71°W.	5.3	S. 72°W.	7.1	S. 76°W.	6.2	N. 87°W.	7.7	N. 74°W.	6.9	N. 68°W.	8.7
3,500	S. 60°W.	5.3	N. 81°W.	7.1	S. 80°W.	14.6	S. 88°W.	9.6	S. 68°W.	7.4	S. 78°W.	6.0	S. 87°W.	9.0	S. 86°W.	7.4	S. 7°W.	3.8	N. 72°W.	7.0	N. 67°W.	8.4
4,000	S. 65°W.	8.5	N. 83°W.	8.0	N. 68°W.	21.0	N. 74°W.	11.4	S. 87°W.	11.5	N. 87°W.	7.8	S. 84°W.	11.4	N. 75°W.	9.8	S. 45°W.	4.5	N. 85°W.	6.4	N. 55°W.	10.0
4,500	S. 67°W.	7.6	N. 79°W.	8.8	------	------	------	------	N. 57°W.	12.4	N. 68°W.	6.2	------	------	------	------	------	------	------	------	N. 43°W.	11.6
5,000	S. 17°W.	6.4	W.	6.4	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	N. 26°W.	13.6

TABLE 1.—*Free-air temperatures, relative humidities, and vapor pressures during May, 1926*

TEMPERATURE (°C.)

Altitude, m. s. l.	Broken Arrow, Okla. (233 meters)		Due West S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)		*Washington, D. C. (7 meters)
	Mean	Departure from 8-year mean	Mean	Departure from 6-year mean	Mean	Departure from 9-year mean	Mean	Departure from 8-year mean	Mean	Departure from 8-year mean	Mean
Meters											
Surface	20.7	+1.2	19.9	−0.4	17.0	+3.5	22.2	−0.3	17.2	+0.7	15.6
250	20.6	+1.2	19.6	−0.4	------	------	21.3	−0.3	17.0	+0.8	14.6
500	19.3	+1.7	17.6	−0.1	16.4	+3.3	19.6	−0.2	15.2	+1.5	14.2
750	17.9	+1.8	15.9	0.0	14.4	+3.0	18.0	−0.4	14.2	+2.3	13.1
1,000	16.5	+1.6	14.3	−0.1	13.1	+3.2	17.1	−0.1	13.0	+2.6	11.6
1,250	15.1	+1.4	12.6	−0.3	12.1	+3.6	16.0	−0.2	11.6	+2.7	10.2
1,500	13.5	+1.1	11.1	−0.4	10.6	+3.6	15.0	−0.1	10.1	+2.7	9.0
2,000	10.4	+0.7	7.7	−1.1	7.6	+3.6	12.2	−0.5	7.7	+2.9	6.7
2,500	7.5	+0.5	5.3	−0.8	4.3	+3.3	9.7	−0.3	5.5	+3.2	4.1
3,000	4.3	+0.3	2.5	−0.8	1.0	+2.9	6.6	−0.6	2.9	+3.4	1.3
3,500	1.0	+0.1	−0.9	−1.3	−2.5	+2.2	3.6	−0.6	0.3	+3.7	−2.0
4,000	−1.9	+0.3	−5.1	−2.3	−6.0	+1.8	0.5	−0.7	−3.5	+2.7	−5.2
4,500	−4.7	+0.3	------	------	−10.2	+1.0	------	------	------	------	−8.3
5,000	−7.1	+0.2	------	------	------	------	------	------	------	------	−10.9

RELATIVE HUMIDITY (%)

Surface	64	−6	61	−1	51	−9	73	+2	64	+2	74
250	64	−6	61	−1	------	------	74	+2	64	+2	69
500	61	−8	60	−3	51	−9	74	+1	62	0	62
750	60	−8	60	−4	52	−7	75	+3	60	−2	59
1,000	59	−8	60	−4	52	−7	70	+1	61	−1	60
1,250	58	−7	61	−3	50	−9	65	0	61	−1	62
1,500	58	−5	62	−2	50	−9	59	−2	61	−1	64
2,000	54	−6	62	0	50	−9	54	0	58	−1	65
2,500	53	−4	53	−6	49	−9	47	−4	49	−5	63
3,000	54	−1	50	−5	49	−7	49	−1	43	−7	61
3,500	53	−2	54	+3	56	+3	43	−5	45	−6	64
4,000	50	−6	62	+15	57	+5	45	−5	69	+19	63
4,500	48	−6	------	------	61	+8	------	------	------	------	58
5,000	54	−6	------	------	------	------	------	------	------	------	58

VAPOR PRESSURE (*mb.*)

Surface	15.67	−0.59	13.82	−1.08	9.58	+0.25	19.57	+0.11	12.82	+0.95	13.18
250	15.52	−0.59	13.55	−1.09	------	------	18.77	+0.09	12.60	+0.95	11.57
500	13.75	−0.44	11.86	−1.10	9.36	+0.27	16.93	−0.01	10.95	+0.96	10.06
750	12.58	−0.20	10.70	−1.10	8.37	+0.35	15.52	+0.17	9.81	+0.92	8.98
1,000	11.55	−0.16	9.79	−0.98	7.70	+0.42	13.55	−0.07	9.21	+1.15	8.30
1,250	10.41	−0.14	8.97	−0.86	7.07	+0.38	11.63	−0.24	8.54	+1.24	7.81
1,500	9.37	+0.08	8.16	−0.77	6.46	+0.38	9.82	−0.45	7.90	+1.34	7.44
2,000	6.92	−0.47	6.28	−0.98	5.32	+0.40	7.50	−0.27	6.63	+1.52	6.48
2,500	5.56	−0.25	4.30	−1.52	4.21	+0.32	5.55	−0.68	4.85	+1.06	5.11
3,000	4.53	−0.10	3.17	−1.40	3.30	+0.26	4.47	−0.70	3.91	+1.22	3.97
3,500	3.48	−0.31	2.35	−1.26	2.90	+0.56	2.71	−1.42	3.55	+1.35	3.24
4,000	2.66	−0.46	1.32	−1.47	2.11	+0.34	1.81	−1.62	3.70	+2.11	2.47
4,500	2.07	−0.45	------	------	1.59	+0.23	------	------	------	------	1.53
5,000	1.93	−0.43	------	------	------	------	------	------	------	------	1.13

* Naval Air Station.

THE WEATHER ELEMENTS

By P. C. DAY, In Charge of Division

PRESSURE AND WINDS

The most important feature of the weather was the marked absence of important cyclones and anticyclones. Pressure changes were frequent, but they were usually of small degree, and barometric depressions that in their early formation gave promise of developing into storms of wide extent frequently contracted their areas as they moved eastward, lost their important cyclonic characteristics, and failed to influence materially the weather along their paths.

In the absence of extensive cyclonic storms there was an important deficiency in precipitation over the central and eastern districts and drought more or less severe prevailed to a wide extent, though moderately cool weather over eastern and southern districts prevented as serious injury to growing vegetation as would have resulted had severe heat accompanied the dry weather as is frequently the case.

The precipitation from these poorly developed cyclones was mainly light, and usually coincident only over comparatively small areas, though locally heavy in a few instances.

Important precipitation occurred in the lower Mississippi Valley on the 2d and 3d. In southern Louisiana the falls were unusually heavy, particularly in the vicinity of New Orleans, where more than 9 inches fell in less than 10 hours and nearly 7 inches in about 3 hours. Precipitation on these dates covered much of the Mississippi Valley region, and during the following day extended over most eastern districts, though the falls were mainly light.

Rather extensive precipitation, though mostly light, overspread the Great Plains and western Mountain districts from the 7th to 9th, extending into the Mississippi Valley and southeastern States on the 10th and 11th, where the amounts were mainly larger, reaching an inch or more in portions of the middle Gulf States.

Widely scattered though mainly light precipitation occurred from the upper Mississippi Valley southeastward to the Atlantic coast from the 14th to 16th, and thence northeastward along the coast during the 16th and 17th, the amounts increasing to the northward and ranging up to 3 inches or more at points in New Jersey and southern New England.